IEM's AI Modeling: Short-term COVID-19 Projections
Date: 9/14/20

Leveraging over 15 years of support to HHS for medical consequence modeling and our proprietary artificial intelligence (AI) models, IEM believes that our Coronavirus model outputs can be used to assist localities and their medical facilities to better prepare for an increase in hospitalizations, to better plan for and locate drive-through testing facilities, and to determine where increased levels of transmission may be occurring.

We have been refining our AI model over the past month and are confident in its ability to provide accurate 7-day projections that can be used for operational and logistical planning.

AI-based Model Background

IEM is currently using an AI model to fit data from various sources and project new cases of COVID-19. We do not assume the average number of secondary infections (R-value) stays the same over time. IEM's AI model finds the best R-value over time to evaluate how it changes over the course of the outbreak. The IEM modeling team is running ~11 million simulations to fit each state's data and using the best fit for the R-value to project new cases over the next 7 days. The AI models are executed on a daily basis to evaluate the changing dynamics of the COVID-19 pandemic. Our projections have typically been within 20%, and are often within 10%, of actual confirmed cases.

The projections shown in this document are based on data pulled in as of 9/14/20 9 a.m.

Please provide any feedback or send any questions that you might have to us. We are continually updating and improving the model, so your feedback is critical.

Also, if you have more current or refined data for your State, Commonwealth or Territory that you would like IEM to factor in, please let us know.

IEM's Modeling Lead

Dr. Prasith "Sid" Baccam is a **Computational Epidemiologist expert** at IEM with more than **20 years of experience in medical consequence modeling and simulation of disease outbreaks** and medical consequences following hypothetical attacks with biological agents or emerging infectious diseases. He develops key simulation models and decision support tools at IEM, specializing in public health, disaster response, and medical countermeasures (MCM) to enhance data-driven decision making and improve modeling assumptions.

Upon receiving his **Ph.D. in Applied Mathematics and Immunobiology** at Iowa State University, Dr. Baccam worked as a Postdoctoral Research Associate at Los Alamos National Laboratory where he focused on researching viral and immunological modeling. After his stint at Los Alamos, Dr. Baccam has served as Task Lead in multiple public health projects have allowed him to develop expertise as a mathematical biologist and a leader on high-performance modeling and simulation teams.

He has worked with state and local public health officials as well as Federal agencies, including **HHS**, the Centers for Disease Control and Prevention (**CDC**), and the Department of Homeland Security (**DHS**). Dr. Baccam has published numerous papers on public health response models and implications on policy and has been invited to participate in workshops and symposiums held by the Institute of Medicine (now the National Academy of Health). His modeling results have been briefed to the **Executive Office of the President** and informed two presidential policy actions.

Florida State Projections
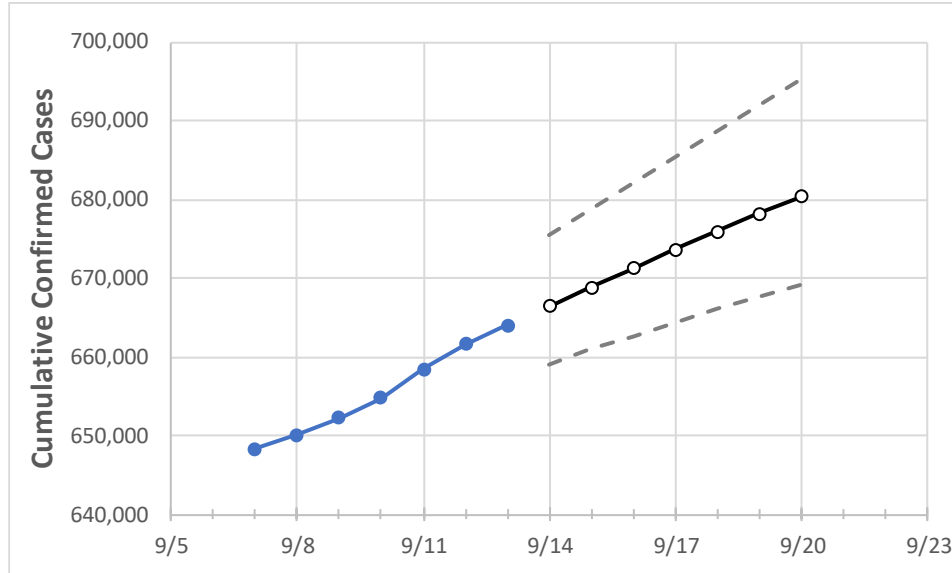
	Actual Confirmed Cases On:				Projected Cases For:						
	9/10	9/11	9/12	9/13	9/14	9/15	9/16	9/17	9/18	9/19	9/20
Florida	654,731	658,381	661,571	663,994	666,445	668,859	671,235	673,574	675,876	678,144	680,376

Note: The State's projection shows a "best estimate" curve (the solid line with circles) and the dotted lines are the upper and lower estimates around that best estimate. Our projections have typically been within 20%, and are often within 10%, of actual confirmed cases.

Florida Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	9/10	9/11	9/12	9/13	9/14	9/15	9/16	9/17	9/18	9/19	9/20
Alachua	5,898	6,029	6,241	6,401	6,493	6,591	6,694	6,804	6,919	7,042	7,171
Broward	73,869	74,084	74,273	74,434	74,574	74,709	74,838	74,962	75,081	75,196	75,305
Charlotte	2,827	2,849	2,858	2,871	2,882	2,893	2,903	2,914	2,924	2,934	2,943
Collier	12,096	12,132	12,169	12,209	12,233	12,257	12,280	12,302	12,324	12,346	12,366
Duval	28,051	28,230	28,370	28,458	28,579	28,700	28,820	28,940	29,060	29,179	29,297
Hillsborough	38,917	39,138	39,298	39,450	39,598	39,744	39,888	40,030	40,171	40,309	40,446
Lake	6,921	6,972	7,021	7,046	7,076	7,105	7,133	7,161	7,189	7,216	7,242
Lee	19,309	19,370	19,451	19,488	19,529	19,568	19,605	19,642	19,677	19,711	19,744
Manatee	10,772	10,803	10,868	10,886	10,907	10,927	10,947	10,966	10,985	11,003	11,021
Miami-Dade	162,894	163,375	163,790	164,086	164,396	164,691	164,974	165,244	165,501	165,747	165,982
Okaloosa	4,502	4,551	4,579	4,620	4,653	4,687	4,721	4,755	4,790	4,825	4,860
Orange	37,473	37,701	37,846	37,939	38,051	38,160	38,268	38,373	38,476	38,578	38,677
Osceola	11,634	11,684	11,740	11,772	11,804	11,836	11,866	11,896	11,925	11,953	11,980
Palm Beach	43,532	43,724	43,873	44,025	44,152	44,277	44,400	44,521	44,641	44,759	44,875
Pasco	8,411	8,464	8,507	8,527	8,552	8,577	8,601	8,625	8,648	8,671	8,693
Pinellas	20,655	20,795	20,872	20,922	20,988	21,054	21,119	21,185	21,249	21,314	21,378
Polk	18,121	18,228	18,337	18,473	18,578	18,683	18,788	18,893	18,997	19,101	19,205
Sarasota	7,500	7,533	7,585	7,619	7,644	7,668	7,692	7,716	7,740	7,763	7,786
Seminole	8,459	8,492	8,532	8,552	8,580	8,608	8,635	8,661	8,687	8,713	8,738
St. Johns	4,759	4,813	4,858	4,887	4,931	4,976	5,023	5,070	5,119	5,169	5,221
Sumter	2,069	2,086	2,101	2,103	2,111	2,118	2,126	2,133	2,140	2,146	2,153
Volusia	9,931	10,027	10,103	10,160	10,210	10,260	10,309	10,359	10,408	10,457	10,506

Some recipients of our daily COVID-19 short-term (7 day) projections have requested projections of demand for: hospital bed, intensive care unit (ICU) beds, and mechanical ventilation. We realize that different states and localities will have different characteristics for hospital demand of COVID-19 cases, and we are presenting the best assumptions we could find for those medical demands based on scientific literature and health data reporting. Specifically:

- *Beds: For hospitalization, we use a range of 10% and 20% of cases require hospitalization based on CDC's report (MMWR, March 18, 2020) and state reports of COVID-19 cases.*
- *ICU: The CDC report found that 24% of hospitalized cases require ICU care.*
- *Ventilators: Based on clinical data from China and state reports, we assume that 50% of ICU cases require a ventilator.*

If you have other estimates for these assumptions, please share them with us as we work to refine our modeling, assumptions, and data on a daily basis.

*The medical demands shown in the table assume 20% of **cumulative** confirmed cases require hospitalization. To get the medical demand for the assumption that 10% of confirmed cases require hospitalization, simply divide the demand by 2.*

Florida Medical Demands by County

	Actual Confirmed Cases On:				Projected Cases (Hospitalized) [ICU] {Ventilator} For:		
	9/10	9/11	9/12	9/13	9/15	9/17	9/19
Alachua	5,898	6,029	6,241	6,401	6,591 (1,318) [316] {158}	6,804 (1,361) [327] {163}	7,042 (1,408) [338] {169}
Broward	73,869	74,084	74,273	74,434	74,709 (14,942) [3,586] {1,793}	74,962 (14,992) [3,598] {1,799}	75,196 (15,039) [3,609] {1,805}
Charlotte	2,827	2,849	2,858	2,871	2,893 (579) [139] {69}	2,914 (583) [140] {70}	2,934 (587) [141] {70}
Collier	12,096	12,132	12,169	12,209	12,257 (2,451) [588] {294}	12,302 (2,460) [591] {295}	12,346 (2,469) [593] {296}
Duval	28,051	28,230	28,370	28,458	28,700 (5,740) [1,378] {689}	28,940 (5,788) [1,389] {695}	29,179 (5,836) [1,401] {700}
Hillsborough	38,917	39,138	39,298	39,450	39,744 (7,949) [1,908] {954}	40,030 (8,006) [1,921] {961}	40,309 (8,062) [1,935] {967}
Lake	6,921	6,972	7,021	7,046	7,105 (1,421) [341] {171}	7,161 (1,432) [344] {172}	7,216 (1,443) [346] {173}
Lee	19,309	19,370	19,451	19,488	19,568 (3,914) [939] {470}	19,642 (3,928) [943] {471}	19,711 (3,942) [946] {473}
Manatee	10,772	10,803	10,868	10,886	10,927 (2,185) [525] {262}	10,966 (2,193) [526] {263}	11,003 (2,201) [528] {264}
Miami-Dade	162,894	163,375	163,790	164,086	164,691 (32,938) [7,905] {3,953}	165,244 (33,049) [7,932] {3,966}	165,747 (33,149) [7,956] {3,978}
Okaloosa	4,502	4,551	4,579	4,620	4,687 (937) [225] {112}	4,755 (951) [228] {114}	4,825 (965) [232] {116}
Orange	37,473	37,701	37,846	37,939	38,160 (7,632) [1,832] {916}	38,373 (7,675) [1,842] {921}	38,578 (7,716) [1,852] {926}
Osceola	11,634	11,684	11,740	11,772	11,836 (2,367) [568] {284}	11,896 (2,379) [571] {285}	11,953 (2,391) [574] {287}
Palm Beach	43,532	43,724	43,873	44,025	44,277 (8,855) [2,125] {1,063}	44,521 (8,904) [2,137] {1,069}	44,759 (8,952) [2,148] {1,074}
Pasco	8,411	8,464	8,507	8,527	8,577 (1,715) [412] {206}	8,625 (1,725) [414] {207}	8,671 (1,734) [416] {208}
Pinellas	20,655	20,795	20,872	20,922	21,054 (4,211) [1,011] {505}	21,185 (4,237) [1,017] {508}	21,314 (4,263) [1,023] {512}
Polk	18,121	18,228	18,337	18,473	18,683 (3,737) [897] {448}	18,893 (3,779) [907] {453}	19,101 (3,820) [917] {458}
Sarasota	7,500	7,533	7,585	7,619	7,668 (1,534) [368] {184}	7,716 (1,543) [370] {185}	7,763 (1,553) [373] {186}
Seminole	8,459	8,492	8,532	8,552	8,608 (1,722) [413] {207}	8,661 (1,732) [416] {208}	8,713 (1,743) [418] {209}
St. Johns	4,759	4,813	4,858	4,887	4,976 (995) [239] {119}	5,070 (1,014) [243] {122}	5,169 (1,034) [248] {124}
Sumter	2,069	2,086	2,101	2,103	2,118 (424) [102] {51}	2,133 (427) [102] {51}	2,146 (429) [103] {52}
Volusia	9,931	10,027	10,103	10,160	10,260 (2,052) [492] {246}	10,359 (2,072) [497] {249}	10,457 (2,091) [502] {251}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at bryan.koon@iem.com or 850-519-7966 or Stephanie Tennyson at stephanie.tennyson@iem.com or 202-309-4257.